

GRADE LEVEL CONTENT EXPECTATIONS

5
MATH

v.6.04

NUMBER & OPERATIONSALGEBRAMEASUREMENTGEOMETRYDATA & PROBABILITY

Welcome to a preview of Michigan's mathematical future! This document not only introduces Michigan's new Grade Level Content Expectations for mathematics, it also establishes high expectations in mathematics to better prepare all K-12 Michigan students for the challenges of the future.

Creating grade-level expectations involves a complex combination of understanding of mathematics, curriculum, student learning, teaching, current practices, and policy. Curriculum directors, mathematics educators, and classroom teachers from Michigan school districts across the state, together with mathematics and mathematics education faculty from universities across the state, have been involved in the development and/or review of the **Michigan Mathematics Grade Level Content Expectations**. The GLCE are intended to be usable as a framework for the development of grade-by-grade assessments, and to provide teachers with a guide for their instructional and curricular emphases in classrooms. The expectations were constructed to feature continuity from one grade to the next, and to ensure coherence both mathematically and pedagogically. These expectations represent a challenge toward which to aspire; in some cases, teachers and mathematics educators will be called on to move beyond their current practice and experience into territory that will be both demanding and rewarding. Michigan students can rise to the challenge of high academic standards. This document provides a set of ambitious goals for all of us.

This document is intended to be an assessment tool. This means students will be expected to be proficient in the concepts and skills included in this document at the end of the indicated grade level. These expectations are written to convey intended performances by students. The expectations here generally represent key landmarks in mathematics learning — areas where students are expected to have consolidated their understandings and skills. Thus it does not attempt to elaborate all of the precursor ideas and concepts that lead to a particular expectation in a particular grade level — it instead assumes that teachers will build up to the expectations through exploration and development of concepts and processes

The Grade Level Content Expectations are not designed to be a curriculum document, or to function as a scope and sequence framework. It is not designed to suggest the various pedagogical options and strategies that might best enable students to attain these expectations. Rather, it should serve as a basis for the development of a curriculum and instructional strategies that would help the students attain the concepts and skills necessary to meet the GLCE. Various groups are being organized

(continued on next page)

to develop clarification documents, content examples, more elaborated explanations, and suggestions for professional development that would support these expectations. Ultimately, teachers, school personnel and district leaders will need to collaborate and draw on their own professional wisdom and experience, as well as on research, to decide how best to organize instruction to help their students meet these expectations.

The mathematics content expectations have been organized into five strands: Number and Operations, Algebra, Geometry, Measurement, and Data and Probability.

These expectations are being presented in two formats; one designed to show specific grade level expectations and a second to show how the expectations transition from one grade level to the next. In the **grade level** format the expectations are organized first by the five strands. Each of the strands is then broken down into content pieces titled “Topics” in an attempt to cluster related ideas for teaching continuity. Under each “Topic” are listed the expectations.

The second format is a “**cross-grade**” version, which has been designed with the intent that one grade level can be easily compared with another and to highlight the mathematical growth that is envisioned across the grades. This format also has been organized into the five strands. However, each strand has been subdivided into broader, more conceptual groupings called “Domains,” to allow for cross grade comparison of the expectations. In several of the strands, the “domains” are similar to the “standards” in *Principles and Standards for School Mathematics* from the National Council of Teachers of Mathematics. In the “cross-grade” version, some key expectations are “cross-listed” in grey when they seem especially crucial to the development of another strand. For instance, several strands from the Number and Operations strand are also listed in grey in the Algebra strand.

Although this organization does not include what have typically been called “process” strands, the importance of mathematical process in the development of these proficiencies cannot be underestimated. Embedded within these expectations are emphases on representation, problem solving, and reasoning as appropriate. The importance of making mathematical connections is conveyed through the cross listing. Finally, the process of communication is foundational to all of mathematics learning.

With the cooperation of all those involved in the education of Michigan students, we can enable our young people to attain the highest standards – and thereby open doors for them to have fulfilling and successful lives in a quantitatively and technologically complex future.

FIFTH GRADE

In the fifth grade, emphasis within the number area shifts to understanding of the addition and subtraction of fractions, with continued consolidation of multiplication and division concepts and skills with whole numbers. The idea of remainders in whole number division is addressed. Students learn the meaning of a fraction as the result of a division problem, and learn to work with decimals and percentages. In geometry and measurement, there is emphasis on the meaning and measurement of angles and on solving problems involving areas and angles. Work in number using exponents and factors begins to lead to algebraic ideas that will be more visible in grade six.

NUMBER AND OPERATIONS	<p>Understand division of whole numbers</p> <p>N.MR.05.01 Understand the meaning of division of whole numbers, with and without remainders; relate division to fractions and to repeated subtraction.</p> <p>N.MR.05.02 Relate division of whole numbers with remainders to the form $a = bq + r$; e.g., $34 \div 5 = 6 \text{ r } 4$, so $5 \cdot 6 + 4 = 34$; note remainder (4) is less than divisor (6).</p> <p>N.MR.05.03 Write mathematical statements involving division for given situations.</p> <hr/> <p>Multiply and divide whole numbers</p> <p>N.FL.05.04 Multiply a multi-digit number by a two-digit number; recognize and be able to explain common computational errors such as not accounting for place value.</p> <p>N.MR.05.05 Solve applied problems involving multiplication and division of whole numbers.</p> <p>N.FL.05.06 Divide fluently up to a four-digit number by a two-digit number.</p> <hr/> <p>Find prime factorizations of whole numbers</p> <p>N.MR.05.07 Find the prime factorization of numbers between 1 and 50, express in exponential notation, e.g., $24 = 2^3 \times 3^1$, and understand that every whole number can be expressed as a product of primes.</p> <hr/> <p>Understand meaning of decimal fractions and percentages</p> <p>N.ME.05.08 Understand the relative magnitude of ones, tenths, and hundredths and the relationship of each place value to the place to its right, e.g., 1 is 10 tenths, one tenth is 10 hundredths.</p> <p>N.ME.05.09 Understand percentages as parts out of 100, use % notation, and express a part of a whole as a percentage.</p> <hr/> <p>Understand fractions as division statements; find equivalent fractions</p> <p>N.ME.05.10 Understand a fraction as a statement of division, e.g., $2 \div 3 = \frac{2}{3}$ using simple fractions and pictures to represent.</p> <p>N.ME.05.11 Given two fractions, express them as equivalent fractions with a common denominator; but not necessarily a <u>least</u> common denominator, e.g., $\frac{1}{2} = \frac{4}{8}$ and $\frac{3}{4} = \frac{6}{8}$; use denominators less than 12 or factors of 100.</p> <hr/> <p>Multiply and divide fractions</p> <p>N.FL.05.12 Find the product of two unit fractions with small denominators using area model.</p> <p>N.FL.05.13 Divide a fraction by a whole number and a whole number by a fraction using simple unit fractions.</p> <hr/> <p>Add and subtract fractions using common denominators</p> <p>N.FL.05.14 Add and subtract fractions with unlike denominators of 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 100, using the common denominator that is the product of the denominators of the 2 fractions, e.g.,</p> $\begin{aligned} \frac{3}{8} + \frac{7}{10} &= \frac{(3 \times 10) + (7 \times 8)}{80} \\ &= \frac{30 + 56}{80} \\ &= \frac{86}{80} \end{aligned}$
----------------------------------	--

Multiply and divide by powers of ten

N.MR.05.15 Multiply a whole number by powers of 10: 0.01, 0.1, 1, 10, 100, 1,000; and identify patterns.

N.FL.05.16 Divide numbers by 10's, 100's, 1,000's, using mental strategies.

N.MR.05.17 Multiply one-digit whole numbers by decimals up to two decimal places.

Solve applied problems with fractions

N.FL.05.18 Given an applied situation involving addition and subtraction of fractions, write mathematical statements describing the situation.

N.MR.05.19 Solve word problems that involve finding sums and differences of fractions with unlike denominators using knowledge of equivalent fractions.

N.FL.05.20 Solve applied problems involving fractions and decimals; include rounding of answers and checking reasonableness; use examples involving money.

N.MR.05.21 Solve for the unknown in such equations as: $\frac{1}{4} + x = \frac{7}{12}$.

Express, interpret, and use ratios; find equivalences

N.MR.05.22 Express fractions and decimals as percentages and vice versa.

N.ME.05.23 Express ratios in several ways given applied situations, e.g., 3 cups to 5 people, 3 : 5, 3/5; recognize and find equivalent ratios.

MEASUREMENT

Know, and convert among, measurement units within a given system

M.UN.05.01 Recognize the equivalence of 1 liter, 1,000 ml and 1000 cm³ and include conversions among liters, milliliters, and cubic centimeters.

M.UN.05.02 Know the units of measure of volume: cubic centimeter; cubic meter; cubic inches, cubic feet, cubic yards, and use their abbreviations (cm³, m³, in³, ft³, yd³).

M.UN.05.03 Compare the relative sizes of one cubic inch to one cubic foot, and one cubic centimeter to one cubic meter.

M.UN.05.04 Convert measurements of length, weight, area, volume, and time within a given system using easily manipulated numbers.

Find areas of geometric shapes using formulas

M.PS.05.05 Represent relationships between areas of rectangles, triangles, and parallelograms using models.

M.TE.05.06 Understand and know how to use the area formula of a triangle:

$A = \frac{1}{2}bh$ (where b is length of the base and h is the height), and represent using models and manipulatives.

M.TE.05.07 Understand and know how to use the area formula for a parallelogram:

$A = bh$, and represent using models and manipulatives.

Understand the concept of volume

M.TE.05.08 Build solids with unit cubes and state their volumes.

M.TE.05.09 Use filling (unit cubes or liquid), and counting or measuring to find the volume of a cube and rectangular prism.

M.PS.05.10 Solve applied problems about the volumes of rectangular prisms using multiplication and division and using the appropriate units.

GEOMETRY	<p>Know the meaning of angles, and solve problems</p> <p>G.TR.05.01 Associate an angle with a certain amount of turning; know that angles are measured in degrees; understand that 90°, 180°, 270°, and 360° are associated, respectively, with $1/4$, $1/2$, and $3/4$ and full turns.</p> <p>G.GS.05.02 Measure angles with a protractor; and classify them as acute, right, obtuse, or straight.</p> <p>G.GS.05.03 Identify and name angles on a straight line and vertical angles.</p> <p>G.GS.05.04 Find unknown angles in problems involving angles on a straight line, angles surrounding a point and vertical angles.</p> <p>G.GS.05.05 Know that angles on a straight line add up to 180° and angles surrounding a point add up to 360°; justify informally by “surrounding” a point with angles.</p> <p>G.GS.05.06 Understand why the sum of the interior angles of a triangle is 180° and the sum of the interior angles of a quadrilateral is 360°, and use these properties to solve problems.</p> <p>Solve problems about geometric shapes</p> <p>G.GS.05.07 Find unknown angles using the properties of: triangles, including right, isosceles, and equilateral triangles; parallelograms, including rectangles and rhombuses; and trapezoids.</p>
DATA AND PROBABILITY	<p>Construct and interpret line graphs</p> <p>D.RE.05.01 Read and interpret line graphs, and solve problems based on line graphs, e.g., distance-time graphs, and problems with two or three line graphs on same axes, comparing different data.</p> <p>D.RE.05.02 Construct line graphs from tables of data; include axis labels and scale.</p> <p>Find and interpret mean and mode for a given set of data</p> <p>D.AN.05.03 Given a set of data, find and interpret the mean (using the concept of fair share) and mode.</p> <p>D.AN.05.04 Solve multi-step problems involving means.</p>